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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/646,526	08/22/2003	Kenneth S. Collins	6915 P08	8504

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EXAMINER

ARANCIBIA, MAUREEN GRAMAGLIA

ART UNIT PAPER NUMBER

1763

DATE MAILED: 03/07/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

10/646,526

Applicant(s)

COLLINS ET AL.

Examiner

Maureen G. Arancibia

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --
Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 19 December 2005.
- 2a) ☒ This action is FINAL. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-26 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-26 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
 - ☐ Certified copies of the priority documents have been received in Application No. _____.
 - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date <u>11/05/02/06</u> | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

Terminal Disclaimers

1. The terminal disclaimers filed on 19 December 2005 disclaiming the terminal portion of any patent granted on this application which would extend beyond the expiration date of any patent granted on Application Serial Nos. 10/646,528; 10/646,532; or 10/646,612 have been reviewed and are accepted. The terminal disclaimers have been recorded.

Claim Rejections - 35 USC § 103

2. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

3. This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

4. Claims 1-4, 6-16, and 18-26 are rejected under 35 U.S.C. 103(a) as being unpatentable over U.S. Patent 6,321,134 to Henley et al. (from Applicant's IDS) in view of U.S. Patent Application Publication 2003/0029567 to Dhindsa et al.

In regards to Claim 1, Henley et al. teaches a system for processing a workpiece, comprising: (A) a plasma immersion ion implantation (PIII) reactor (Figure 4), comprising: an enclosure 422 comprising a side wall and a ceiling and defining a chamber 414; a workpiece support pedestal 465 within the chamber having a workpiece support surface facing said ceiling and defining a process region extending generally across said wafer support pedestal; and an RF plasma source power generator 466; (B) a second wafer processing apparatus (Column 4, Lines 18-40; Column 6, Lines 18-27); and (C) a wafer transfer apparatus 20 for transferring said workpiece between said plasma immersion ion implantation reactor and said second wafer processing apparatus. (Figures 1 and 3)

In regards to Claims 1, 13-16, and 18-24, Henley et al. does not teach that the PIII reactor comprises a gas distribution apparatus, that the RF plasma source generator is coupled to the ceiling or sidewall of the chamber and the wafer support pedestal is coupled to an RF return potential for capacitively coupling RF source power into the process zone, or that the PIII reactor comprises an RF bias generator having an RF bias frequency of any of the claimed values and coupled to said workpiece support pedestal.

Dhindsa et al. teaches a capacitively coupled plasma apparatus (Figure 1), comprising a gas distribution apparatus (Paragraph 25), an RF plasma source

generator 54 coupled to the ceiling 22, a wafer support pedestal 28 coupled to an RF return potential via conductive plate 26 (Paragraph 24), and an RF bias generator 60 having an RF bias frequency of about 2 MHz coupled to the workpiece support pedestal via electrode 34. (Paragraphs 24 and 25)

It would have been obvious to one of ordinary skill in the art to replace the inductively coupled plasma generating means taught by Henley et al. with the capacitively coupled plasma generating means taught by Dhindsa et al., as an art-recognized equivalent means of generating plasma. It would also have been obvious to one of ordinary skill in the art to further modify the PIII reactor taught by Henley et al. to include a gas distribution apparatus and to include an RF bias generator with a frequency of about 2 MHz coupled to the workpiece support pedestal. The motivation for including a gas distribution apparatus, as taught by Dhindsa et al. (Paragraph 25), would have been to supply the process gas to the process region with a showerhead effect. The motivation for including an RF bias generator with a frequency of about 2 MHz coupled to the workpiece support pedestal, as taught by Dhindsa et al. (Paragraph 25), would have been to allow control of the ion energy in the plasma.

The gas distribution apparatus taught by the combination of Henley et al. and Dhindsa et al. would be inherently capable of introducing process gas containing a first species to be ion implanted into a layer of the workpiece. The RF bias with a frequency of about 2 MHz coupled to the workpiece support pedestal taught by the combination of Henley et al. and Dhindsa et al. would inherently meet the limitations of Claims 13-15 and 18-20, depending on the other process settings of the plasma reactor. Moreover,

the frequency of about 2 MHz meets the limitations recited in Claims 21-24. Finally, the plasma reactor taught by the combination of Henley et al. and Dhindsa et al. would still be capable of performing plasma immersion ion implantation, based on the process settings. This rejection is based on the fact the apparatus structure taught above has the inherent capability of being used in the manner intended by the Applicant. When a rejection is based on inherency, a rejection under 35 U.S.C. 102 or U.S.C. 103 is appropriate. (See *In re Fitzgerald* 205 USPQ 594 or MPEP 2112).

In regards to Claim 2, Henley et al. teaches a cleaning species source plasma reactor 24 (Column 11, Line 60 - Column 12, Line 7), which would inherently comprise a source of cleaning species precursor gases in order to be able to generate a plasma. Henley et al. also teaches a passage (*wafer transfer chamber*, Figure 3) coupling said cleaning plasma reactor to the plasma immersion ion implantation reactor.

In regards to Claims 3 and 4, the particular type of gas used is a process limitation rather than an apparatus limitation, and the recitation of a particular type of gas does not limit an apparatus claim, see *In re Casey*, 152 USPQ 235; *In re Rishoi*, 94 USPQ 71; *In re Young*, 25 USPQ 69; *In re Dulberg*, 129 USPQ 348; *Ex parte Thibault*, 64 USPQ 666; and *Ex parte Masham*, 2 USPQ2d 1647. This rejection is based on the fact the apparatus structure taught by Henley et al. has the inherent capability of being used in the manner intended by the Applicant. When a rejection is based on inherency, a rejection under 35 U.S.C. 102 or U.S.C. 103 is appropriate. (See *In re Fitzgerald* 205 USPQ 594 or MPEP 2112).

In regards to Claim 6, Henley et al. teaches that the processing system can comprise an ion beam implantation apparatus (Column 14, Lines 25-26).

While Henley et al. does not expressly teach that the processing system can include both the PIII apparatus and an ion beam implantation apparatus, it would have been obvious to one of ordinary skill in the art to include both of these apparatuses in the system. The motivation for doing so would have been to perform further processing on the workpiece.

Such a system would be inherently capable of implanting a second species into a layer of the workpiece. This rejection is based on the fact the apparatus structure taught above has the inherent capability of being used in the manner intended by the Applicant. When a rejection is based on inherency, a rejection under 35 U.S.C. 102 or U.S.C. 103 is appropriate. (See *In re Fitzgerald* 205 USPQ 594 or MPEP 2112).

In regards to Claim 7, the inclusion of material or article worked upon by a structure being claimed does not impart patentability to the claims. *In re Young*, 75 F.2d 966, 25 USPQ 69 (CCPA 1935) (as restated in *In re Otto*, 312 F.2d 937, 136 USPQ 458, 459 (CCPA 1963)). Also, the particular types of species to be implanted are process limitations rather than apparatus limitations, and the recitation of which does not limit an apparatus claim, see *In re Casey*, 152 USPQ 235; *In re Rishoi*, 94 USPQ 71; *In re Young*, 25 USPQ 69; *In re Dulberg*, 129 USPQ 348; *Ex parte Thibault*, 64 USPQ 666; and *Ex parte Masham*, 2 USPQ2d 1647. This rejection is based on the fact the apparatus structure taught by Henley et al. and Dhindsa et al. has the inherent capability of being used in the manner intended by the Applicant. When a rejection is

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based on inherency, a rejection under 35 U.S.C. 102 or U.S.C. 103 is appropriate. (See *In re Fitzgerald* 205 USPQ 594 or MPEP 2112).

In regards to Claim 8, it has been held that the mere duplication of parts has no patentable significance unless a new and unexpected result is produced. *In re Harza*, 274 F.2d 669, 124 USPQ 378 (CCPA 1960). Moreover, a second PIII reactor would be capable of implanting any species into a layer of the workpiece. This rejection is based on the fact the apparatus structure taught by Henley et al. and Dhindsa et al. has the inherent capability of being used in the manner intended by the Applicant. When a rejection is based on inherency, a rejection under 35 U.S.C. 102 or U.S.C. 103 is appropriate. (See *In re Fitzgerald* 205 USPQ 594 or MPEP 2112).

In regards to Claim 9, see the discussion of Claim 7.

In regards to Claim 10, Henley et al. teaches an anneal chamber 303. (Column 12, Lines 8-16)

In regards to Claim 11, the plasma etching chamber 301 taught by Henley et al. (Column 12, Lines 45-51) would be capable of stripping a photoresist. This rejection is based on the fact the apparatus structure taught by Henley et al. and Dhindsa et al. has the inherent capability of being used in the manner intended by the Applicant. When a rejection is based on inherency, a rejection under 35 U.S.C. 102 or U.S.C. 103 is appropriate. (See *In re Fitzgerald* 205 USPQ 594 or MPEP 2112).

In regards to Claim 12, Henley et al. teaches a wet clean chamber 305. (Column 17, Line 53 - Column 18, Line 12)

In regards to Claim 25, again, it has been held that the mere duplication of parts has no patentable significance unless a new and unexpected result is produced. *In re Harza*, 274 F.2d 669, 124 USPQ 378 (CCPA 1960).

In regards to Claim 26, Henley et al. teaches wafer handling apparatus 20.

5. Claim 5 is rejected under 35 U.S.C. 103(a) as being unpatentable over Henley et al. in view of Dhindsa et al. as applied to Claim 1 above, and further in view of U.S. Patent 6,643,557 to Miller et al.

The teachings of Henley et al. and Dhindsa et al. were discussed above. Henley et al. additionally teaches a process controller 31.

The combination of Henley et al. and Dhindsa et al. does not expressly teach an optical metrology chamber for obtaining a measurement of ion implantation in a workpiece, and coupled to the process controller.

Miller et al. teaches an optical metrology chamber 150 (Column 4, Lines 44-48) for obtaining a measurement of ion implantation in a workpiece (Column 8, Lines 34-37) and coupled to a process controller 130.

It would have been obvious to one of ordinary skill in the art to modify the combination of Henley et al. and Dhindsa et al. to include an optical metrology chamber coupled to the process controller. The motivation for doing so, as taught by Miller et al. (Column 8, Lines 36-39), would have been to allow for adjustment of ion implantation dosage on subsequent ion implantation processes.

6. Claim 17 is rejected under 35 U.S.C. 103(a) as being unpatentable over Henley et al. in view of Dhindsa et al. as applied to claim 1 above, and further in view of U.S. Patent 4,579,618 to Celestino et al.

The teachings of Henley et al. and Dhindsa et al. were discussed above.

The combination of Henley et al. and Dhindsa et al. does not expressly teach that the RF source power generator can be coupled to the wafer support pedestal and the ceiling coupled to an RF return potential.

Celestino et al. teaches that an RF source power generator 37 can be capacitively coupled to a wafer support pedestal 18 and a chamber enclosure 15 can be coupled to an RF return potential (Figure 1; Column 2, Lines 56-57).

It would have been obvious to one of ordinary skill in the art to modify the PIII reactor taught by the combination of Henley et al. and Dhindsa et al. to have the RF source power generator coupled to the wafer support pedestal and the ceiling coupled to an RF return potential. The motivation for reversing the couplings in this way, and thereby coupling both the RF source power and the RF bias power to the wafer support pedestal, as taught by Celestino et al. (Column 3, Lines 18-20 and Column 4, Lines 63-65), would have been to have a reactor with increased flexibility and control, and that is easily interfaced with an automated wafer transport system.

Response to Arguments

7. Applicant's arguments filed 19 December 2005 have been fully considered but they are not persuasive.

Applicant's argument that the teachings of Dhindsa et al. can not be combined with the teachings of Henley et al. due to a difference in pressure regimes is not convincing. It would be well within the skill of one of ordinary skill in the art to adjust the pressure in the plasma apparatus taught by the combination of Henley et al. and Dhindsa et al. as necessary to perform a desired plasma processing, simply by adjusting the gas supply and exhaust flow rates. This is a matter of intended use of the apparatus taught by the combination of Henley et al. and Dhindsa et al., and is not convincing to overcome the rejection of the pending apparatus claims as set forth above.

In response to applicant's argument that there is no suggestion to combine the references, the examiner recognizes that obviousness can only be established by combining or modifying the teachings of the prior art to produce the claimed invention where there is some teaching, suggestion, or motivation to do so found either in the references themselves or in the knowledge generally available to one of ordinary skill in the art. See *In re Fine*, 837 F.2d 1071, 5 USPQ2d 1596 (Fed. Cir. 1988) and *In re Jones*, 958 F.2d 347, 21 USPQ2d 1941 (Fed. Cir. 1992). In this case, perhaps a simpler way of viewing the rejection made above is to consider the combination of Henley et al. and Dhindsa et al., where the inductive plasma reactor taught by Henley et al. is simply replaced by the capacitive plasma reactor taught by Dhindsa et al. Again, it would have been obvious to modify the teachings of Henley et al. with the teachings of Dhindsa et al. to have an art-recognized equivalent means of generating plasma, with the process gas being supplied to the process region with a showerhead effect, and the

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ion energy in the plasma being controlled by the RF bias generator. (Dhindsa et al., Paragraph 25)

Applicant's argument that the bias source of Dhindsa et al. would not be capable of supporting ion implantation is not convincing. The capacitive plasma apparatus taught by Dhindsa et al. meets the structural limitations of the plasma reactor recited in part (A) of Claim 1, and also teaches an RF plasma source generator with a frequency of 27 MHz, and an RF bias generator with a frequency of 2 MHz (as recited in Claim 24). Dhindsa et al. teaches the same structural features as recited in the claims, and would therefore be *structurally capable of performing the intended use* of plasma immersion ion implantation. Moreover, Dhindsa et al. teaches that the bias voltage is *actively controlled* by adjusting the power of the RF bias generator, in order to control the ion energy in the plasma. (Paragraphs 25, 29-31, and 33) Therefore, if the plasma reactor taught by Dhindsa et al. were employed for the *intended use* of ion implantation, the RF bias generator taught by Dhindsa et al. would be structurally capable of producing a desired bias voltage, which would inherently correspond to an ion implantation depth.

In response to applicant's argument that the references fail to show certain features of applicant's invention, it is noted that the features upon which applicant relies (i.e., "high voltage bias electrode features such as those disclosed in applicants' FIGS. 97 and 98") are not recited in the rejected claim(s). Although the claims are interpreted in light of the specification, limitations from the specification are not read into the claims. See *In re Van Geuns*, 988 F.2d 1181, 26 USPQ2d 1057 (Fed. Cir. 1993).

Finally, in response to applicant's argument that the examiner's conclusion of obviousness is based upon improper hindsight reasoning, it must be recognized that any judgment on obviousness is in a sense necessarily a reconstruction based upon hindsight reasoning. But so long as it takes into account only knowledge which was within the level of ordinary skill at the time the claimed invention was made, and does not include knowledge gleaned only from the applicant's disclosure, such a reconstruction is proper. See *In re McLaughlin*, 443 F.2d 1392, 170 USPQ 209 (CCPA 1971).

Conclusion

8. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. U.S. Patent Application Publication 2005/0011450 to Higashiura teaches a capacitive plasma apparatus (Figure 1) with an RF power source generator 50 with a frequency of 27-100 MHz coupled to an upper electrode and an RF bias generator with a frequency of 2 MHz coupled to the workpiece support pedestal. Higashiura teaches that the capacitive plasma apparatus is used for ion implantation. (Paragraph 79)

9. **THIS ACTION IS MADE FINAL.** Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

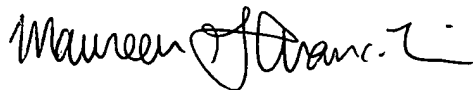
A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the

shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Maureen G. Arancibia whose telephone number is (571) 272-1219. The examiner can normally be reached on core hours of 10-5, Monday-Friday.

10. If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Parviz Hassanzadeh can be reached on (571) 272-1435. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).



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